U.S. EPA Environmental Technology Verification (ETV) Program

Abby Waits, EPA ETV Program

SBIR Phase I Kick-Off Meeting

April 5, 2007

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ETV Objectives

- Provide credible performance information for commercial-ready technology to help solve high-risk environmental problems. **Aid:**

  - ✓ **Purchasers in making decisions to purchase innovative technologies**
  - ✓ **Policymakers and Regulators in making policy and permitting decisions for innovative technologies**
  - ✓ **Vendors/Developers in selling and further developing innovative technologies**

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Verification Definition

- To establish or prove the truth of the performance of a technology under specific, predetermined criteria or protocols and adequate QA procedures.
- ETV does not:
  - ✓ Pass/fail,
  - ✓ Approve, or
  - ✓ Certify technologies

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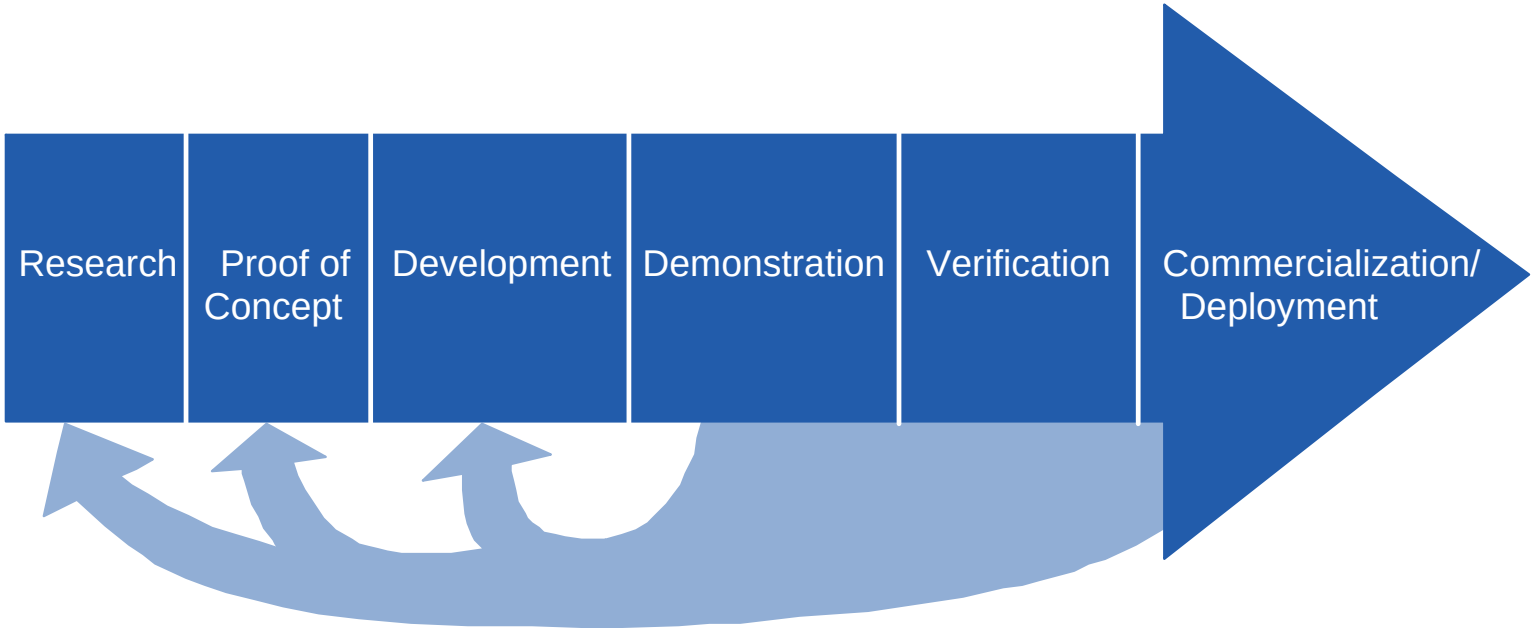
ETV and the Technology Continuum



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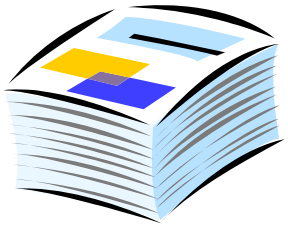
ETV Verification Process

EPA, verification organizations, stakeholders OR EPA-only (ESTE)...



With stakeholders, develop test protocols, quality-assurance test plans

AND

Conduct technology testing

Identify priority technology categories

Identify vendors, collaborators

Write verification report

ETV Outreach **www.epa.gov/etv**

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ETV Successes

- **381 verifications, 88 protocols completed since 1995**
- **Collaborations and vendor cost-sharing leverage ETV, generating over 50% of total funds**
- **Over 500 stakeholders active in advisory groups and technical panels**
- **Web site use and international interest at more than 3.0 million web hits/year and growing**
- **New case studies booklets document and project program outcomes**

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Six ETV Centers

- **ETV Air Pollution Control Technology Center**
  RTI International
- **ETV Advanced Monitoring Systems Center**
  Battelle
- **ETV Drinking Water Systems Center**
  NSF International
- **ETV Greenhouse Gas Technology Center**
  Southern Research Institute
- **ETV Water Quality Protection Center**
  NSF International
- **ETV P2 Coatings and Coating Equipment Pilot**
  Concurrent Technologies Corporation

Environmental and Sustainable Technology Evaluations (ESTE)

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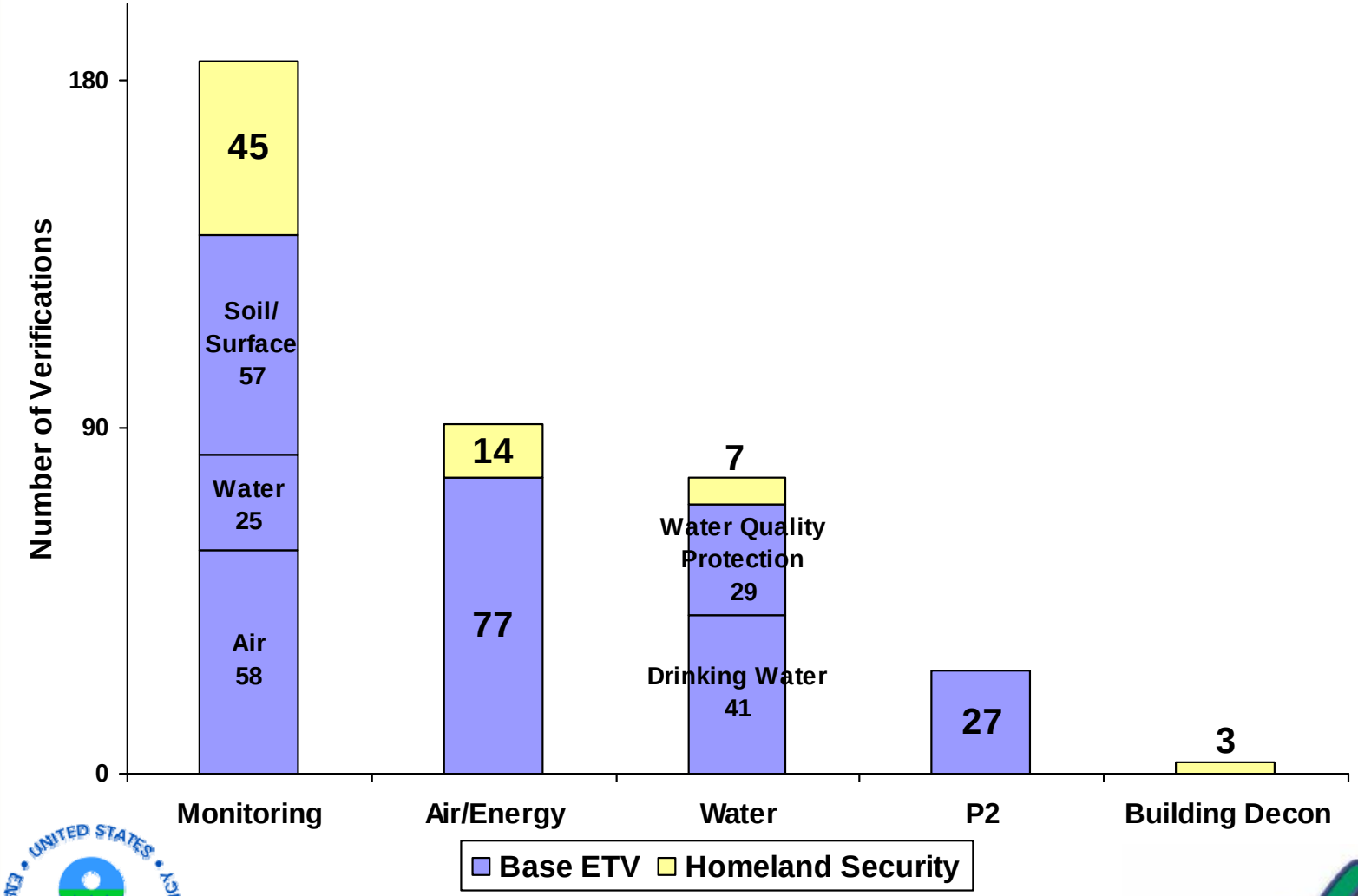
ETV Verifications by Area/Media (1995-Present)



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Major ETV Center Verification Categories for 2005-2007

- **Air and Water Monitoring**

  Rapid and/or continuous emission monitors for mercury, hydrogen sulfide, dioxin; personal impactors for particulate matter; ballast water screening tools; chemical oxygen demand technologies

- **Air Pollution Control**

  Diesel engine retrofit technology; baghouse filtration products; indoor air quality; outdoor wood hydronic heaters; VOCs and NO_X control technologies

- **Drinking Water**

  Removal of pathogens and arsenic; emergency mobile drinking water treatment; point-of-use/point-of-entry devices

- **Greenhouse Gas Reduction**

  Fuel efficient transporation devices (diesel fuel additives); energy efficient technologies; distributed generation/combined heat and power

- **Water Quality Protection**

  Stormwater treatment; residential or on-site nutrient reduction; water infrastructure rehabilitation; ballast water treatment

- **Pollution Prevention**

  Low emissions coatings and equipment

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ETV Partners with...

- **U.S. National Oceanic and Atmospheric Administration**
  Multi-parameter water probes, atrazine detection
- **U.S. Coast Guard**
  Ballast water treatment
- **U.S. Dept of Energy; States of Massachusetts, Connecticut; Illinois Clean Coal Institute**
  Mercury emission monitors
- **U.S. Dept of Defense**
  Monitors for explosives, PCBs in soils; dust suppressants
- **States of Alaska, Pennsylvania, Michigan, California**
  Drinking water arsenic treatment

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ETV Partners with...

- **States of/counties in Georgia, Kentucky, Michigan; EPA SBIR Program**
  Storm water treatment
- **States of New York, Colorado**
  Waste-to-energy
- **DuPont, U.S. Geological Survey**
  Nutrient monitors
- **Chlorine Chemistry Council, EPA Office of Solid Waste, and EPA Office of Air Quality Planning and Standards**
  Dioxin monitors
- **U.S. Dept of Agriculture**
  Ambient ammonia monitors, hydrogen sulfide monitors

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ETV Outreach

- Stakeholders provide outreach
- Centers provide specific outreach to users, regulators
  - ✓ Example: NSF embarking on new effort to engage states in value of verification. Utah recommends verification of drinking water equipment.
- ETV program outreach – conferences (exhibits and presentations), website, papers, field days and press events, targeted factsheets

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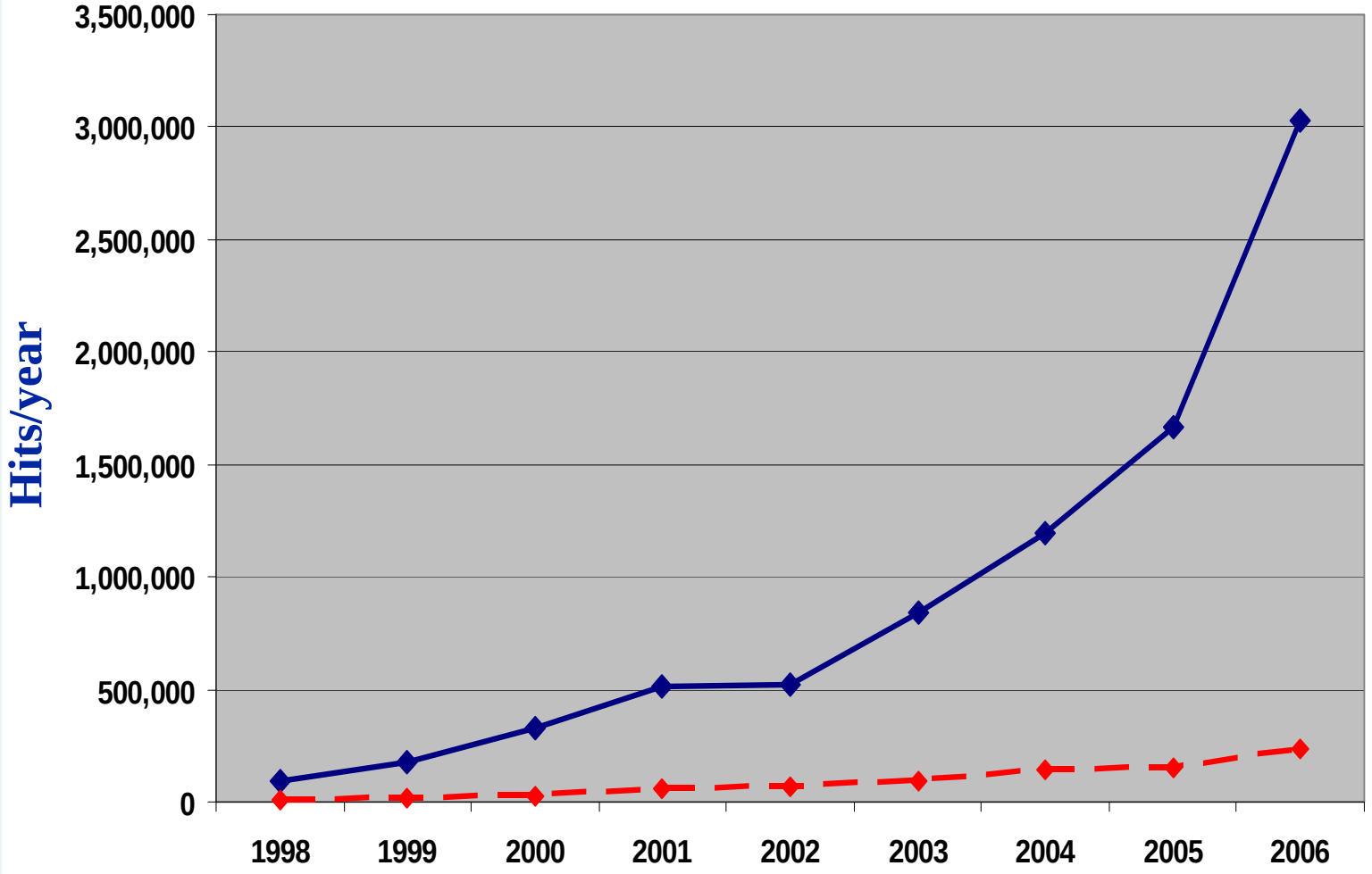
www.epa.gov/etv



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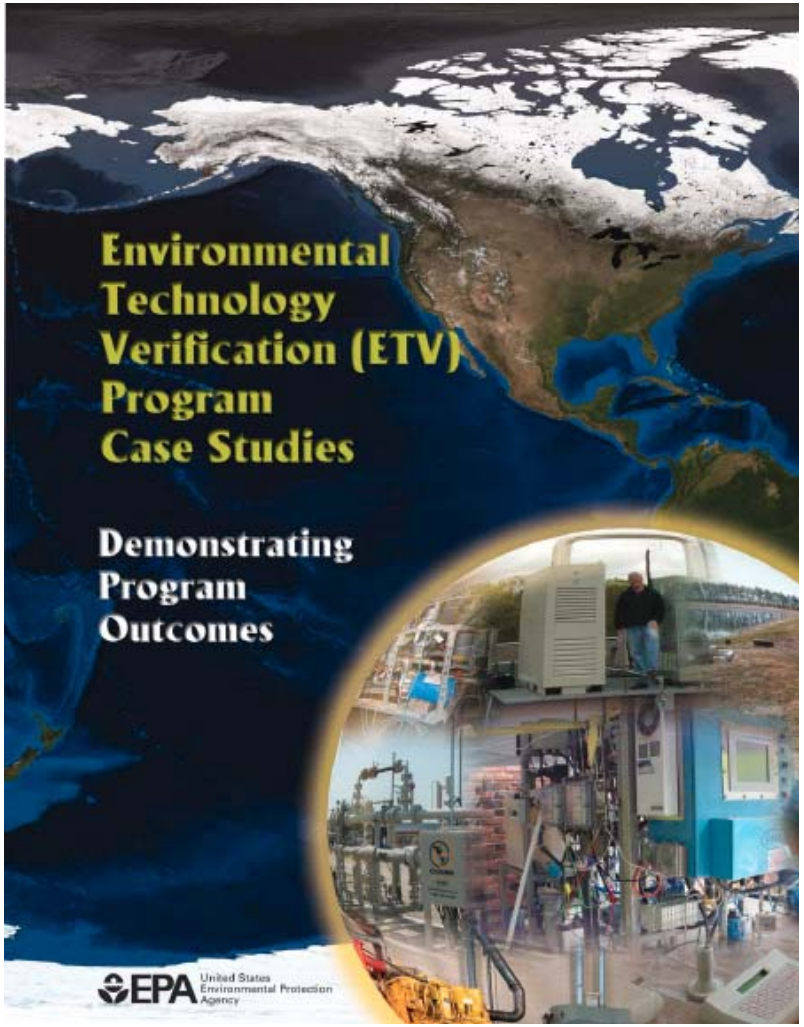
ETV Outcomes



NEW in 2006!

ETV Case Studies

2 Volumes

15 case studies, plus one update

- ✓ **document actual and project possible outcomes of verifications**

Summarizes available info:

- ✓ **vendor sales**
- ✓ **regulatory responses**
- ✓ **pollutant reduction**
- ✓ **projection of health outcomes in four cases - arsenic treatment, MF/UF, nanofiltration, baghouse filtration products, and diesel retrofit**

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ETV Case Study: Diesel Retrofit

- Older model heavy-duty diesel trucks and buses release significant amounts of particulate matter (PM)
  - ✓ PM contributes to serious public health and environmental problems
- ETV verified 7 diesel retrofit technologies in 2003-2005
  - ✓ 6 of the techs reduce PM by 21 to 95%
- At 10% market penetration, for 7 years use, ETV calculates that:
  - ✓ PM emissions would be reduced by 9,000 to 31,000 tons
  - ✓ 683 to 2,380 cases of premature death avoided*
  - ✓ $5 billion to $18 billion in monetary benefits realized*
- Verification makes techs eligible for EPA's Voluntary Diesel Retrofit Program (grants program)
- 1,345 technologies installed as result of verifications and grants

*via a comparison to 2007 Heavy-Duty Highway Rule impacts

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ETV Case Study: Arsenic Drinking Water Treatment

- Arsenic is a known carcinogen with additional non-cancer human health effects
- EPA recently lowered the drinking water standard for arsenic to 10 ppb
- Several thousand small drinking water systems will need to install arsenic treatment techs to comply with new standard
- ETV verified 8 arsenic treatment technologies in 2001 and 2004
  - ✓ These techs could assist up to 3,900 small drinking water systems comply with the new arsenic standard
  - ✓ Average verified removal efficiencies ranged from 50 to 95% (approx) and most reduced arsenic levels to to 5 ppb or less
- At 10% market penetration:
  - ✓ 1.3 to 1.9 avoided cases of lung and bladder cancer per year
  - ✓ 0.7 to 1.0 avoided deaths from the prevention of these cancers per year
  - ✓ $4.8 million to $6.8 million in savings per year due to the prevention of these cancers
- Reduce pilot testing costs for drinking water systems
  - ✓ ASDWA survey notes that a majority of states use ETV results to reduce the frequency and length of site-specific pilot testing

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ETV Case Study: Eductor Vapor Recovery Unit (EVRU)

- 12,670 of the estimated 94,000 oil and natural gas storage tank batteries in the U.S. generate gases that are vented to the environment
- These tank batteries emit 23.3 bscfy* of methane, 7,000 tons per year of HAPs, and more than 22,000 tons per year of VOCs
  - ✓ Methane is a greenhouse gas, and HAPs and VOCs have significant health effects
- ETV verified COMM Engineering's Eductor Vapor Recovery Unit (EVRU) in 2002
  - ✓ 99.91% of the vent gas was recovered during 5 months of testing
- The EVRU has been selected/installed at 11 facilities, in part because of ETV results/outreach. This has resulted in:
  - ✓ Emission reductions of 280 MMscfy** of methane, 1,700 tons per year of HAPs, and 21,600 tons per year of VOCs
  - ✓ Recovery of natural gas with an economic value of approximately $6.3 million per year

*bscfy = billion standard cubic feet per year

**MMscfy = million standard cubic feet per year

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Contact Information

ETV Web Site

www.epa.gov/etv

Abby Waits, EPA

waits.abby@epa.gov

Tel: (513) 569-7884